Proposal to implement seasonal air monitoring at the perimeter monitoring network near the West Lake Landfill Site (WLLS)

An air monitoring network was established at the perimeter of the WLLS in accordance with the "Quality Assurance Project Plan (QAPP) for Baseline Off-Site Air Monitoring and Sampling, West Lake Landfill Site; Bridgeton, MO" Daily air monitoring activities began at this network approximately in June, 2014. The purpose of this sampling effort is to document off-site concentrations of contaminants of concern before construction of the isolation barrier. Monitoring is being conducted for radiological parameters (including alpha-, beta-, and gamma-emitting radionuclides on particulates; radon; and external gamma exposure), as well as typical solid waste landfill gases (including sulfur dioxide [SO_2], hydrogen sulfide [H_2S], and volatile organic compounds [VOC]).

EPA has arranged for placement of the air monitoring stations at the following locations:

Station 1 – Robertson Fire Protection District Station 2, 3820 Taussig Rd., Bridgeton, Missouri

Station 2 – Pattonville Fire Department District, 13900 St Charles Rock Rd., Bridgeton, Missouri

Station 3 – Pattonville Fire Department District Station 2, 3365 McKelvey Rd., Bridgeton, Missouri

Station 4 – Spanish Village Park, 12827 Spanish Village Dr., Bridgeton, Missouri

Station 5 – St. Charles Fire Department Station #2, 1550 S. Main St., St. Charles, Missouri.

These locations were selected to ensure complete coverage around the perimeter of the WLLS and are placed in areas near residential populations.

CURRENT SAMPLING STRATEGY AND METHODOLOGY

EPA began initial evaluation of the five off-site monitoring stations in April 2014; these activities included installation of electrical service, instrument weather housings, monitoring and sampling devices (including particulate air samplers, RAE Systems AreaRAEs, Saphymo GammaTRACERs, E-Perm radon detectors, and thermoluminescence dosimeters), and a real-time remote gas monitoring network. The baseline sampling period began in early June 2014, and was proposed to end prior to initiation of the isolation barrier construction, initially anticipated to start in September 2014.

The data quality objective of collecting baseline off-site air monitoring data is to document preconstruction air quality conditions near the WLLS. To date, data collection for radiological and chemical parameters has been performed in accordance with the following two tables at the perimeter

network.

Table 1A: Sample Summary – Radiological Parameters						
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** May 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per week	Radionuclides in airborne particulates	5 off-site monitoring stations	Assess concentrations of radionuclides present on airborne particulates	Isotopic Th (including Th-230)	EPA NCRFO SOP RPR-250: Operation of Air Samplers without Flow Measurement Capability	Alpha spec. per lab SOP[1]
				Total alpha-emitting Ra		EPA 903.0 & SW-846 9315 as modified by lab SOP[1]
				Isotopic U		Alpha spec. per lab SOP[1]
				Gross alpha/beta		Low background GFPC per lab SOP[1]
				Gamma spectroscopy		Gamma spec. per lab SOP[1]
				Ra-226[2]		EPA 903.0 & SW-846 9315 as modified by lab SOP[1] preceded by 21-day in-growth of Ra-226 progeny
3 badges per station, submitted monthly	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per vendor-provided instructions and Service Guide[4]	NRC Regulatory Guide 4.13
Field Measurements						
3 E-Perms per station, read weekly	Radon in ambient air	5 off-site monitoring stations	Assess concentrations of radon in air	Radon	EPA Region 7 E-PERM Radon Detection System Equipment Guide	NA *(field measurement only)*
1 continuous real-time instrument per station	Gamma exposure rate by Saphymo GammaTRACER (G-M tube)	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per EPA ERT procedures	NA *(field measurement only)*
1 real-time sensor per station	Gamma exposure rate by RAE Systems AreaRAE sensor	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
QC Samples/Measurements						
1 per weekly field blank submittal	Radionuclides on filter media	Field blank	Assess contamination of the filter from field handling	Same as the requested analyses for filter samples	Filter will be handled in the field[2]	Same as the analyses for filter samples
1 each per batch of TLDs	Gamma exposure rate by environmental TLD	Transit/control badge	Assess contributions to gamma exposure rates related to background and badge transit	Gamma exposure rate	Per vendor-provided instructions and Service Guide[4]	NRC Regulatory Guide 4.13
2 replicates per station[5]	Radon in ambient air	5 off-site monitoring stations	Assess total method precision	Radon	EPA Region 7 E-PERM EOG	NA *(field measurement only)*
2 replicates[5]	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess total method precision	Gamma exposure rate	Per vendor-provided instructions and Service Guide	NRC Regulatory Guide 4.13

Alpha spec. = alpha spectroscopy; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; gamma spec. = gamma spectroscopy; GFPC = gas flow proportional counting; G-M = Geiger-Mueller; NA = not applicable; lab = laboratory; NCRFO = National Center for Radiation Field Operations; NRC = U.S. Nuclear Regulatory Commission; Ra = radium; SOP = Standard Operating Procedure; TLD = thermoluminescence dosimeters; Th = thorium; U = uranium

Table 1B: Sample Summary – Chemical and Particulate Parameters						
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** May 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per week	Outdoor air	5 off-site monitoring stations	Assess VOCs	VOCs	EPA ERT SOP 4231.1704 and EPA Region 7 SOP 2313.04	EPA Method T0-15 and lab SOP[1]
Field Measurements						
1 real-time sensor per station	Outdoor air	5 off-site monitoring stations	Assess for typical landfill gasses of concern	CO, SO_2, H_2S, VOCs[2]	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
QC Samples						
1 per week	Outdoor air	Trip blank	Assess contamination of the Summa canister from field handling	VOCs	Trip blank will be handled in the field[3]	EPA Method T0-15 and lab SOP[1]
1 per week	Outdoor air	Field duplicate	Assess total method precision	VOCs	Field duplicate will be co-located with a primary Summa canister and will be sampled concurrent with the primary Summa canister	EPA Method T0-15 and lab SOP[1]

CO = carbon monoxide; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; H_2S = hydrogen sulfide; NA = not applicable; lab = laboratory; $PM_{2.5}$ = particulates less than 2.5 micrometers in diameter; PM_{10} = particulates less than 10 micrometers in diameter; SOP = Standard Operating Procedure; VOC = volatile organic compound

DISCUSSION

Since the inception of this sampling plan, additional consideration has taken place regarding the proposed construction start date of the isolation barrier, including potentially using an alternative barrier system design and technology on site. This has caused the proposed start date of isolation barrier construction to be delayed from the original projection of September 2014 to an estimated winter 2016 timeframe. Additionally, if alternative construction and design options are employed, the nature and extent of potential emissions may change dramatically.

To date, approximately four (4) months of monitoring data has been collected which spans the entire summer season. Data were collected in accordance with the frequencies defined in Tables 1A and 1B above which was based upon a projected barrier construction start of September 2014.

Due to the extension of the barrier construction date, we propose to modify the perimeter air monitoring network sampling schedule so that it samples intermittently, yet sufficiently to capture seasonal variability in both area emissions and meteorological conditions.

We are currently sampling on a semi-continuous basis for all parameters. We propose to adjust the sampling schedule to accommodate a 45 day on / 45 day off schedule, adjusted to capture seasonal variability. Additionally, the sampling technique and frequency for several environmental parameters are proposed for adjustment.

The schedule for the 2014-15 seasonal changes are as follows:

Fall Equinox	September 22, 2014
Winter Solstice	December 21, 2014
Spring Equinox	March 20, 2015
Summer Solstice	June 21, 2015
Fall Equinox	September 22, 2015
Winter Solstice	December 21, 2015

Therefore, we propose that monitoring commence and cease during the following 45 day periods:

MONITORING START DATE	MONITORNG STOP DATE
Operating on current schedule	October 13, 2014
November 28, 2014	January 11, 2015
February 26, 2015	April 11, 2015
May 27, 2015	July 10, 2015
August 25, 2015	October 8, 2015
November 23, 2015	January 6, 2016
February 21, 2016	April 5, 2016

In addition, the original QAPP incorporated use of evacuated SUMMA canisters, analyzed in accordance with EPA Method TO-15 to determine speciated volatile organic compounds. The PRP's sampling plan for on-site baseline measurements was recently approved to incorporate Radiello® passive sampling devices, sampling for fourteen days, to measure volatile organic compounds. We propose to modify EPA's perimeter monitoring approach to also incorporate Radiello® passive sampling devices, sampling for fourteen days at each site in lieu of evacuated canisters to promote data comparability between on and off site measurements during the background data collection phase of this investigation.

The following tables describe the proposed sampling and monitoring method changes:

Table 2A: Sample Summary – Radiological Parameters						
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** September 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per week	Radionuclides in airborne particulates	5 off-site monitoring stations	Assess concentrations of radionuclides present on airborne particulates	Isotopic Th (including Th-230)	EPA NCRFO SOP RPR-250: Operation of Air Samplers without Flow Measurement Capability	Alpha spec. per lab SOP
				Total alpha-emitting Ra		EPA 903.0 & SW-846 9315 as modified by lab SOP
				Isotopic U		Alpha spec. per lab SOP
				Gross alpha/beta		Low background GFPC per lab SOP[1]
				Gamma spectroscopy		Gamma spec. per lab SOP
				Ra-226		EPA 903.0 & SW-846 9315 as modified by lab SOP preceded by 21-day in-growth of Ra-226 progeny
3 badges per station, submitted every 45 day sampling period	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per vendor-provided instructions and Service Guide[4]	NRC Regulatory Guide 4.13
Field Measurements						
3 E-Perms per station, read weekly	Radon in ambient air	5 off-site monitoring stations	Assess concentrations of radon in air	Radon	EPA Region 7 E-PERM Radon Detection System Equipment Guide	NA *(field measurement only)*
1 continuous real-time instrument per station	Gamma exposure rate by Saphymo GammaTRACER (G-M tube)	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	Per EPA ERT procedures	NA *(field measurement only)*
1 real-time sensor per station	Gamma exposure rate by RAE Systems AreaRAE sensor	5 off-site monitoring stations	Assess gamma exposure rates	Gamma exposure rate	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
QC Samples/Measurements						
1 per weekly field blank submittal	Radionuclides on filter media	Field blank	Assess contamination of the filter from field handling	Same as the requested analyses for filter samples	Filter will be handled in the field	Same as the analyses for filter samples
1 each per batch of TLDs	Gamma exposure rate by environmental TLD	Transit/control badge	Assess contributions to gamma exposure rates related to background and badge transit	Gamma exposure rate	Per vendor-provided instructions and Service Guide	NRC Regulatory Guide 4.13
2 replicates per station	Radon in ambient air	5 off-site monitoring stations	Assess total method precision	Radon	EPA Region 7 E-PERM EOG	NA *(field measurement only)*
2 replicates	Gamma exposure rate by environmental TLD	5 off-site monitoring stations	Assess total method precision	Gamma exposure rate	Per vendor-provided instructions and Service Guide	NRC Regulatory Guide 4.13

Alpha spec. = alpha spectroscopy; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; gamma spec. = gamma spectroscopy; GFPC = gas flow proportional counting; G-M = Geiger-Mueller; NA = not applicable; lab = laboratory; NCRFO = National Center for Radiation Field Operations; NRC = U.S. Nuclear Regulatory Commission; Ra = radium; SOP = Standard Operating Procedure; TLD = thermoluminescence dosimeters; Th = thorium; U = uranium

Table 2B: Sample Summary – Chemical and Particulate Parameters						
Site Name: West Lake Landfill Site				**Location:** Bridgeton, Missouri		
START Project Manager: Dave Kinroth				**Activity/ASR #:** NA	**Date:** September 2014	
No. of Samples	**Matrix**	**Location**	**Purpose**	**Requested Analysis**	**Sampling Method**	**Analytical Method/SOP**
Samples Submitted for Laboratory Analysis						
1 sample per station per 14 days	Outdoor air	5 off-site monitoring stations	Assess VOCs	VOCs	Radiello passive sampling device. Per analytical laboratory SOP	Per analytical laboratory SOP
Field Measurements						
1 real-time sensor per station	Outdoor air	5 off-site monitoring stations	Assess for typical landfill gasses of concern	CO, SO_2, H_2S, VOCs[2]	EPA Region 7 AreaRAE EOG	NA *(field measurement only)*
QC Samples						
1 per 14 days	Outdoor air	Trip blank	Assess contamination of the Radiello passive sampler from field handling	VOCs	Trip blank will be handled in the field	Per analytical laboratory SOP
1 per 14 days	Outdoor air	Field duplicate	Assess total method precision	VOCs	Field duplicate will be co-located with a primary Radiello passive sampler and will be sampled concurrent with the primary device	Per analytical laboratory SOP

CO = carbon monoxide; EPA = U.S. Environmental Protection Agency; EOG = Equipment Operating Guide; ERT = Environmental Response Team; H_2S = hydrogen sulfide; NA = not applicable; lab = laboratory; $PM_{2.5}$ = particulates less than 2.5 micrometers in diameter; PM_{10} = particulates less than 10 micrometers in diameter; SOP = Standard Operating Procedure; VOC = volatile organic compound

These recommended changes will need to be incorporated into the current QAPP for baseline off-site monitoring.

CONSIDERATIONS:

Periodic seasonal monitoring will allow for collection of atmospheric monitoring data representative of annual seasonal variability with reduced cost as compared to the current continuous monitoring campaign. Harmonizing the off-site VOC sampling and analysis procedure with the on-site monitoring technique will afford greater data comparability for the purpose of identification and apportionment of landfill emissions. In addition, implementation of this proposal will result in significant cost savings in field operations, data management, and laboratory analytical costs.

If periodic seasonal monitoring is adopted there are several available options:

- Discontinue monitoring at all five sites and demobilize equipment between sampling events

- Discontinue monitoring, turn off monitoring equipment and leave the equipment in place at each site
- Leave monitoring equipment operating during non-sampling dates, but don't collect monitoring data in Viper system

Each of these options has inherent costs related to on-site support, labor, quality assurance, calibration, and data management effort. The most economical approach is recommended.